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EFFECT OF ORGANIC AND INORGANIC SELENIUM ON THE NUTRITIONAL AND OXIDATIVE STABILITY OF COOKED HAM FROM PAMPA ROCHA PIGS IN OUTDOOR SYSTEM

Ana Laura Vodanovich*[1], Nandy Espino[1], Cecilia Carballo[1], Virginia Palleiro[2], Leonardo Salle[3], Alejandra Terevinto[1], Ali Saadoun[1,2] & María Cristina Cabrera [1,2].

1 Facultad de Agronomía, Universidad de la República. Montevideo, Uruguay.
2 Facultad de Ciencias, Universidad de la República. Montevideo, Uruguay.
3 Universidad Católica del Uruguay, Montevideo, Uruguay.
*Corresponding author: avodanovich@fagro.edu.uy

I. INTRODUCTION

Cooked ham, appreciated by consumers for its practicality, nutritional value and sensory acceptability, contributes to the protein balance of the diet. There is a growing demand of the modern consumer for healthier versions of these foods, with better nutritional profile, high technological and sensory quality [1), integrated with welfare, environmental care, in outdoor systems [2]. The incorporation of nutrients in the diet of pigs in outdoor systems is a way to improve the nutritional quality and the value of this meat, particularly meat from local rustic breeds, having a growing interest in local meat products from rustic breeds, being considered a gourmet product [3]. Selenium, an essential trace element for both humans and animals, is noted for its involvement in antioxidant mechanisms [4], increasing the content in meat, while it has also been reported that it can modify the fatty acid profile of meat [5]. The aim of this work was to evaluate the effect of organic and inorganic selenium supplementation (0.3 mg/kg) in the finishing diet of outdoor Pampa Rocha pigs (a local animal genetic resource) on selenium content, lipid and protein oxidation, and fatty acid profile in the cooked ham product.

II. MATERIALS AND METHODS

Cooked hams, were produced in the pilot plant of the Catholic University of Uruguay, following the National Bromatological Regulation (Decree 588/008), with meat came from outdoor Pampa Rocha pigs, fed three diets: a basal diet (control),a basal diet with 0.3 mg/kg of organic selenium (Se-OH-Met; OS), a basal diet with 0.3 mg/kg of inorganic selenium (Na_2SeO_3; IS) in the finishing phase (Approved by ethical committee, CHEA, Udelar). Cooked ham was made with meat from the biceps femoris, quadriceps femoris, gluteus medius and semitendinosus muscles (84.75%), phosphates (0.45%), salt (1.80%), sodium nitrite (0.015%), carrageenan (0.34%), sodium erythorbate (0.045%), sugar (1%) and chilled water (11.6%). After tumbling (10 hours, 5000 total revolutions), the mixture was manually stuffed into polyamide bags, vacuum packed, and cooked in molds at 80 °C until reaching 72 °C at the thermal centre, cooled and stored at -20 °C until analysis. In hams samples, it was quantified total Se content [6], lipid oxidation as TBARS (thiobarbituric acid reactive species; mgMDA/kg, [7]), and the total sulfhydryl (SH) content spectrophotometrically after derivatization by Ellman's reagent, 5,5′-dithiobis (2-nitrobenzoic acid) (DTNB). Lipid was extracted with chloroform/methanol, 2:1 [8] and total fatty acids were methylated [9] and quantified by Gas Chromatographie [10] and expressed as % of total fatty acids. Health indices, atherogenicity (AI), thrombogenesis (TI) and hypocholesterolemic/ hypercholesterolemic (h/H) ratio were estimated [11;12]. Data are presented as the mean ± SEM of n = 6-7 hams per diet. Data were analyzed by one-way ANOVA and, post hoc, Tukey-Kramer test ($p < 0.05$; NCSS,2024).

III. RESULTS AND DISCUSSION

Selenium, OS and IS, in the finishing diet of pigs has shown a protective effect against the lipid oxidation in hams (Figure 1). Also an increase in the selenium content by 36 % with OS and 16% with IS. No significant effect of dietary selenium was observed in protein oxidation as total thiol (SH) content in cooked hams (Table 1) either expressed per milligram of protein or per gram of ham. Since the degree of protein oxidation is reflected in the variations on the content of these groups, and no significant losses of thiols were observed, we concluded that the protein was maintained in its integrality and that the levels of protein oxidation in the cooked ham were similar, for control and selenium supplemented diets.

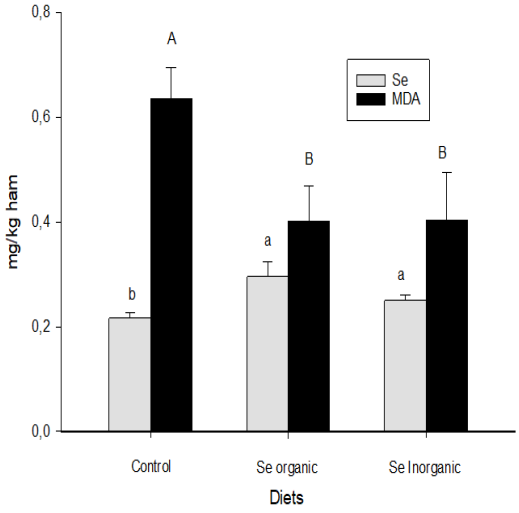


Figure 1.Se content (mg/kg) and lipid oxidation (TBARs;mg/kg MDA), in cooked ham from experimental diets. *a,b*: significant at p<0.05.

Dietary selenium did not modify fatty acid or health indices (Table 2), indicating that this dose of selenium does not change lipids deposition in muscle tissue. Fatty acid profiles show adequate AI and h/H [13;14] for human health in control or in Se supplemented hams, while n-6 results are elevated related to n-3 fatty acids.

Table 1 – Effect of supplementation with Se (0.3 mg/kg of diet), organic (OS) and inorganic (IS), on total thiols as nmolSH/mg protein (SH*) and as nmolSH/g ham (SH**).

	Diets			
	Control	*OS*	*IS*	*p*
SH*	46.62 ± 10.61	68.74 ± 9.68	48.54 ± 9.68	ns
SH **	143,97 ± 29,86	187,90 ± 25,23	133,55 ± 27,26	ns

Table 2- Effect of supplementation with Se (0.3 mg/kg of diet), organic (OS) and inorganic (IS), on total lipids (%) and the fatty acids (%) and health indices of cooked ham.

	Diets			
	Control	*OS*	*IS*	*p*
Lipids	4.15 ± 1.62	5.15 ± 1.34	3.56 ± 0.59	ns
SAT	37.10 ± 0.97	37.40 ± 0.83	36.72 ± 0.49	ns
MUFA	42.00 ± 1.04	44.65 ± 0.84	44.31 ± 1.55	ns
PUFA	20.48 ± 1.41	17.74 ± 1.14	18.71 ± 1.88	ns
n-6	18.52 ± 1.37	15.73 ± 1.13	16.79 ± 1.81	ns
n-3	1.95 ± 0.06	2.01 ± 0.07	1.93 ± 0.10	ns
n-6/n-3	9.43 ± 0.52	7.88 ± 0.61	8.66 ± 0.76	ns
AI	1.54 ± 0.06	1.55 ± 0.04	1.56 ± 0.04	ns
TI	1.02 ± 0.04	1.02 ± 0.04	1.00 ± 0.03	ns
h/H	2.62 ± 0.11	2.59 ± 0.07	2.58 ± 0.06	ns
P/S	0.56 ± 0.05	0.48 ± 0.04	0.52 ± 0.06	ns

IV. CONCLUSION

Selenium supplementation in the diet of finishing Pampa Rocha pigs in outdoor systems resulted in a good strategy for improving the oxidative stability and the nutritional quality in cooked hams. Fatty acid profile or health indices in hams resulted, in part, good for human health independently of dietary selenium probably associated with the outdoor system while n-3 content must be improved in further research running in our laboratory.

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